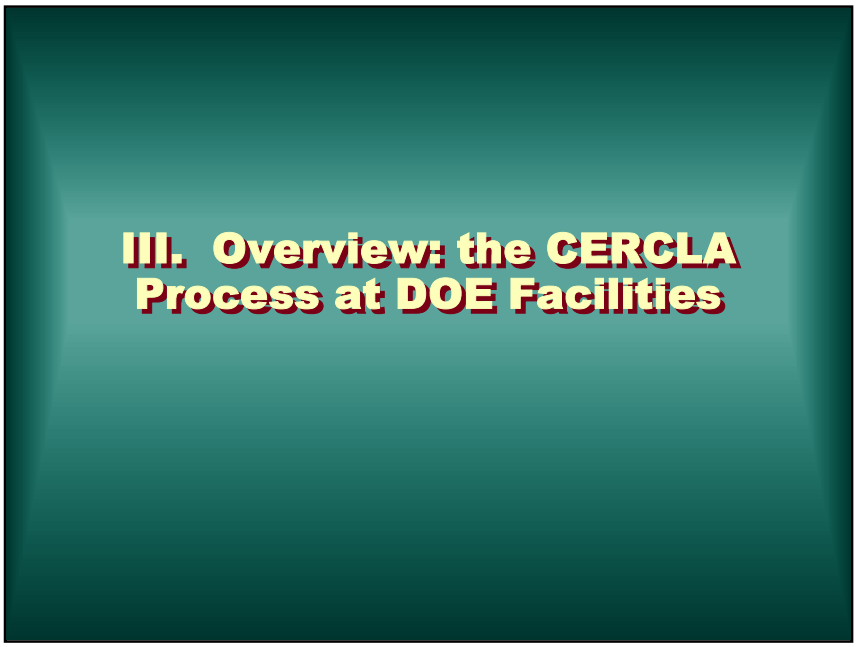


Notes:

The purpose of this overview of the CERCLA process at DOE facilities is to:

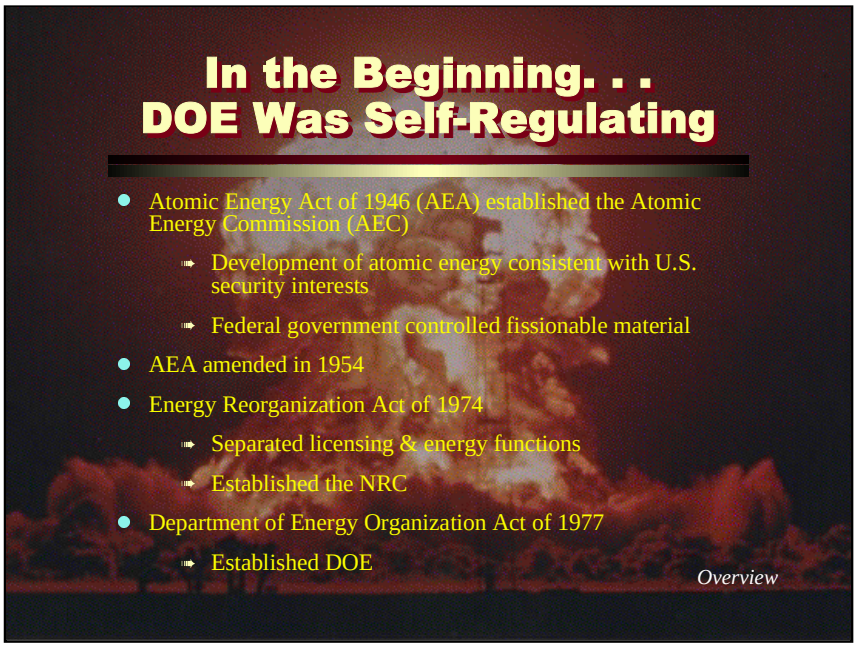
- provide some historical context for the unique regulatory and technical issues facing CERCLA cleanups at DOE facilities,
- briefly discuss the overall CERCLA cleanup process, and
- provide background and history for the case study to be presented on the second day of the course.

Notes:

This talk will be organized as follows:

- First, a discussion of the historical mission of DOE and a description of the early plutonium production process at Oak Ridge National Laboratory (ORNL) will be made.
- Next, the CERCLA process will be briefly outlined.
- Finally, procedural issues specific to DOE will be discussed.

The intent is to emphasize how unique DOE cleanup issues are in the context of the overall CERCLA process and the DOE-specific approach to resolving these unique cleanup issues.



Notes:

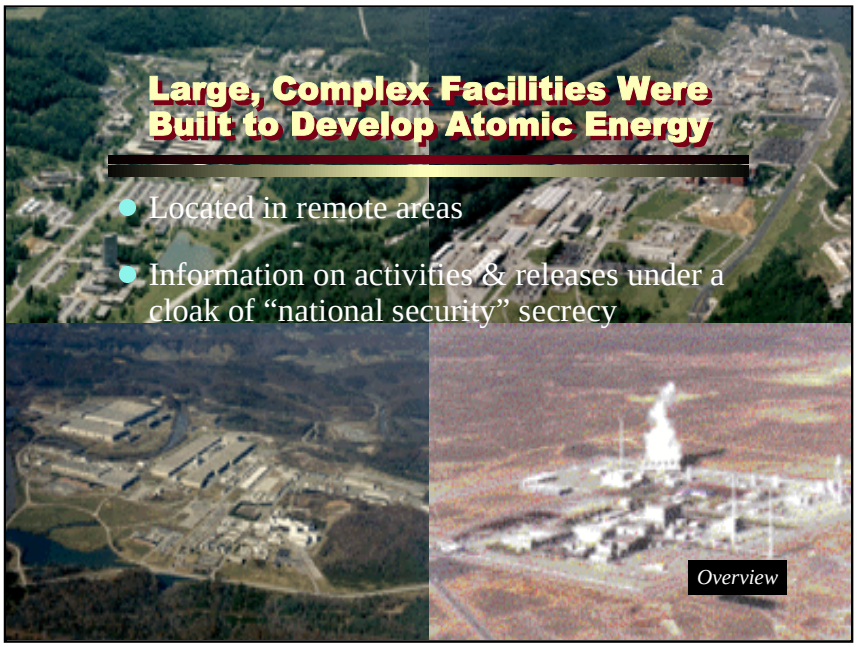
The Atomic Energy Act (AEA) was passed in 1946 to ensure that the development of nuclear energy was conducted in a manner consistent with the security interests of the United States. To this end Congress gave control of the production and use of fissionable material to the Atomic Energy Commission (AEC), the forerunner of DOE.

In 1954 to keep pace with advancing development of nuclear energy, Congress amended the AEA to allow non-federal ownership of nuclear production and utilization facilities.

In 1974 Congress separated the licensing and energy development functions by eliminating the AEC and creating the Nuclear Regulatory Commission (NRC) to oversee licensing and the Energy Research and Development Administration (ERDA) to oversee development of energy technologies. The NRC was given licensing authority for facilities used primarily for the receipt and storage of high-level radioactive wastes. ERDA, however, maintained authority over many existing facilities that produced, used, or disposed of radioactive materials.

With passage of the Energy Reorganizartion Act of 1977, the Department of Energy (DOE) replaced ERDA.

Throughout the history of the AEA and related legislation Congressional emphasis was placed on regulating production and use of nuclear materials. While special attention was given to ultimate disposal of high-level radioactive wastes, day-to-day waste management and cleanup were of lesser concern.



Notes:

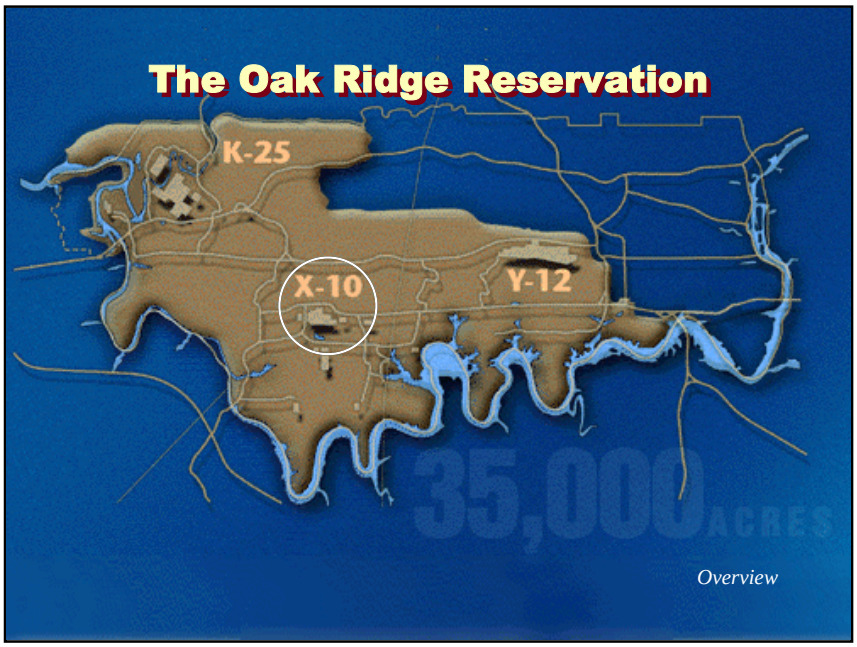
The large DOE facilities typically were located in remote areas away from large populations because of:

- the need to maintain secrecy about nuclear weapons development, and
- the limited knowledge about the short- and long-term health hazards associated with both the radiological and chemical components of nuclear materials.

These facilities were constructed rapidly and with the primary purpose of nuclear materials production. Waste disposal and management were of secondary consideration to weapons production.

The photographs are aerial views of:

- ORNL (top left)
- Y-12 Weapons Plant (top right)
- K-25 Gaseous Diffusion Plant (bottom left)
- Idaho National Engineering Laboratory (INEL) (bottom right)



Notes:

The next few vugraphs will focus on ORNL (X-10 in the above figure). ORNL is one of three DOE facilities on the 3,500-acre Oak Ridge Reservation (ORR). The ORR is listed in the Federal Facilities section of the National Priorities List (NPL).

Notes:

This photograph of the Clinton Laboratories—later named ORNL—was taken on March 1, 1943. The view is from Bethel Valley road looking toward where the 4500N building will later be.

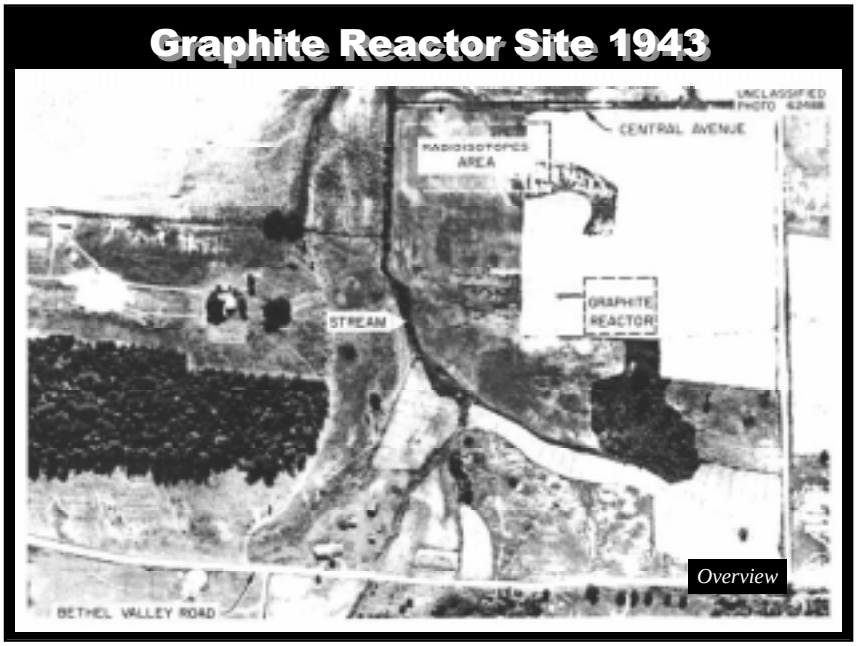
ORNL was originally established primarily for the production and study of plutonium 239 (Pu-239). In 1939 scientists had determined that Pu-239 theoretically could be produced in quantity by neutron bombardment of the non-fissionable uranium 238 (U-238) and used as the fuel for a "super" bomb that would have a decisive effect on the outcome of the war. However, plutonium was a new element which did not exist in nature, and its chemical properties were unknown. Land was acquired in 1942 between the cities of Clinton, Kingston, and Oliver Springs in East Tennessee for the construction of three large secret military large plants to:

- separate fissionable U-235 from non-fissionable U-238 (K-25),
- fabricate atomic bomb components (Y-12), and
- produce and study the chemical properties of Pu-239 (Clinton Laboratories).

In January of 1943 the decision was made to construct two major facilities at the Clinton Laboratories site:

- a Graphite Reactor to produce the Pu-239, and
- a Chemical Pilot Plant to separate, purify, and study the properties of the Pu-239.

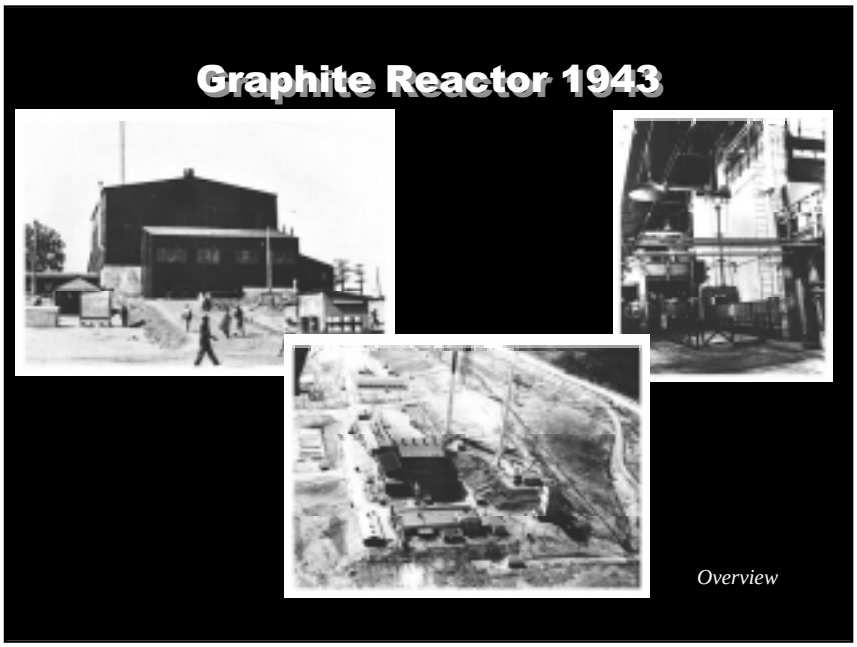
More than 3,000 workers quickly erected 150 buildings between February 1943 and June 1944 at a cost of about $13,000,000.



Notes:

The site selected for the Graphite Reactor was a remote farm area which is shown in this photograph prior to the start of construction. Bethel Valley Road, in the lower part of the picture, is located in approximately the same place today.

The farm road in the upper right portion of the photograph became the central avenue of ORNL. The Graphite Reactor was located in the area appearing as a freshly plowed field in the upper right.



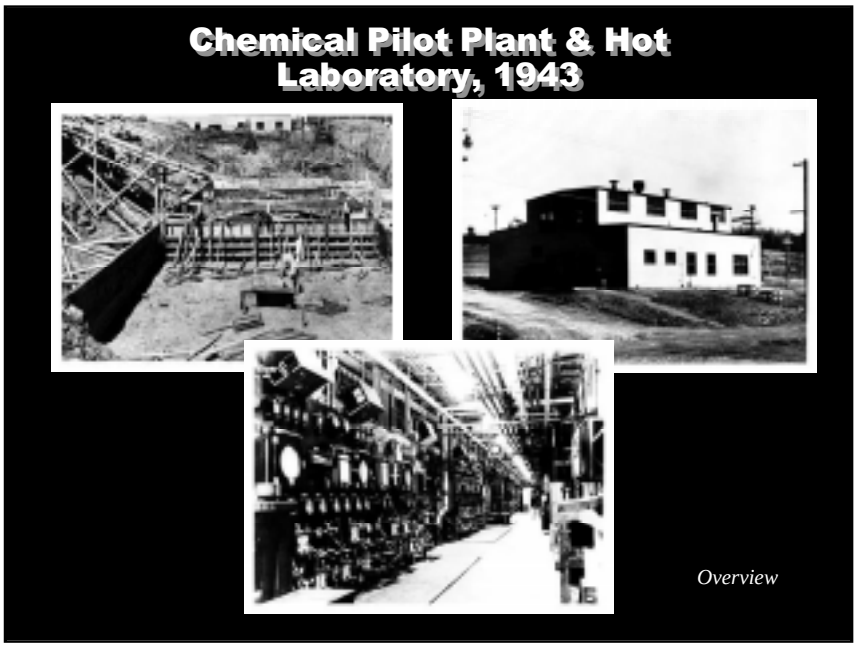
Notes:

Construction on the Graphite Reactor began February 1, 1943, and the reactor was placed in operation on November 4, 1943. It was designed to operate at 1,000 kW, but often exceeded design specifications.

The reactor was basically a 20-ft cube of graphite pierced with horizontal holes arranged in eight-inch centers to contain aluminum-jacketed uranium fuel rods. The reactor was surrounded on all sides by high density concrete, 7-ft thick, to provide radiation shielding.

A 20-ft deep water-filled canal was constructed adjacent to the reactor at a level below its base so that fuel slugs could be pushed manually from the reactor into the canal. The water in the canal provided radiation shielding. The canal was arranged so that fuel from the reactor could be transported in buckets under water from the reactor to the first shielded cell of the adjacent Chemical Processing Pilot Plant Building.

In the Chemical Processing Pilot Plant, a mechanical device was provided to pick up the bucket by remote control and dump the fuel slugs from the bucket into the chemical dissolver tank so that chemical processing operations to separate plutonium could begin.



Notes:

The photograph on the upper left shows the foundation for the Chemical Pilot Plant that received the fuel slugs from the Graphite Reactor via a 20-ft deep underground canal.

The photograph in the middle shows the operating gallery of the pilot plant where all the instruments and controls for remote handling of the chemical processing equipment was located. The slugs were processed in cells surrounded by 5-ft thick walls.

The photograph on the upper right shows the Hot Laboratory Building, which was completed in March 1944. This facility was constructed to provide capability for processing larger quantities of radioisotopes than the Chemical Pilot Plant.

Notes:

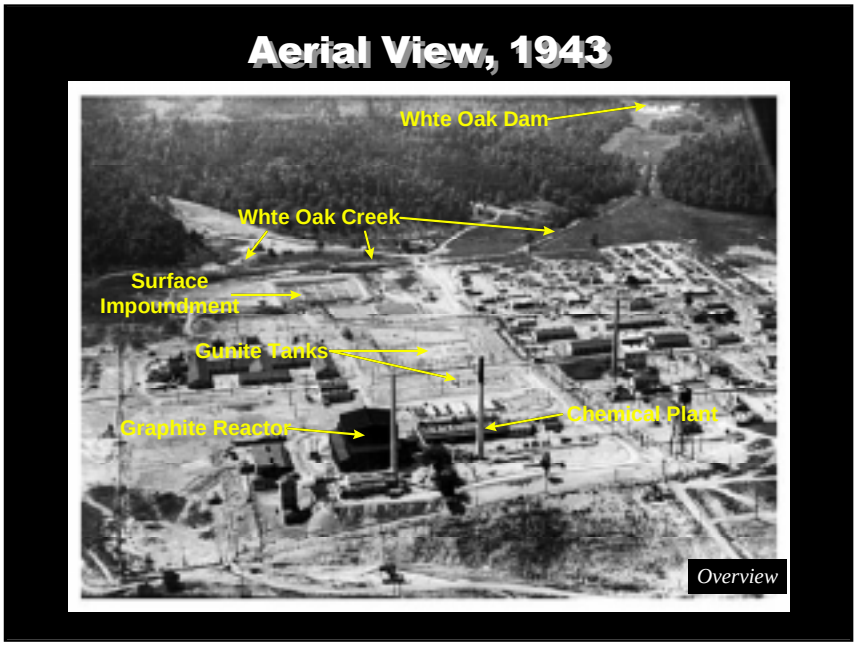
Highly radioactive wastes from the Chemical Pilot Plant and the Hot Laboratory Building were piped into 150,000 Gunite Tanks located down hill from the Graphite Reactor (across the street from where the ORNL Cafeteria is now located). These tanks were surrounded with concrete and buried underground for shielding purposes.

In the photograph above, the circled area shows a man with a water hose standing on top of one of the tanks and offers a glimpse of the size of these tanks.

Initially, all liquid radioactive wastes were stored in the Gunite Tanks. Later when storage capacity was exhausted the incoming wastes were precipitated in the tanks, and the supernatant was pumped to a 1.5 million gallon waste holding pond (impoundment) to allow for additional settling of solids and radioactive decay of shorter half-life radionuclides before discharge. From the impoundment, radioactive liquid wastes were diluted with process water, pH was adjusted, and the liquid wastes were discharged directly to White Oak Creek (WOC).

Notes:

Radioactive effluents drained from the surface impoundments to the WOC. In 1943 the WOC Dam was constructed to retain sediments and effluents from moving to the Clinch River.

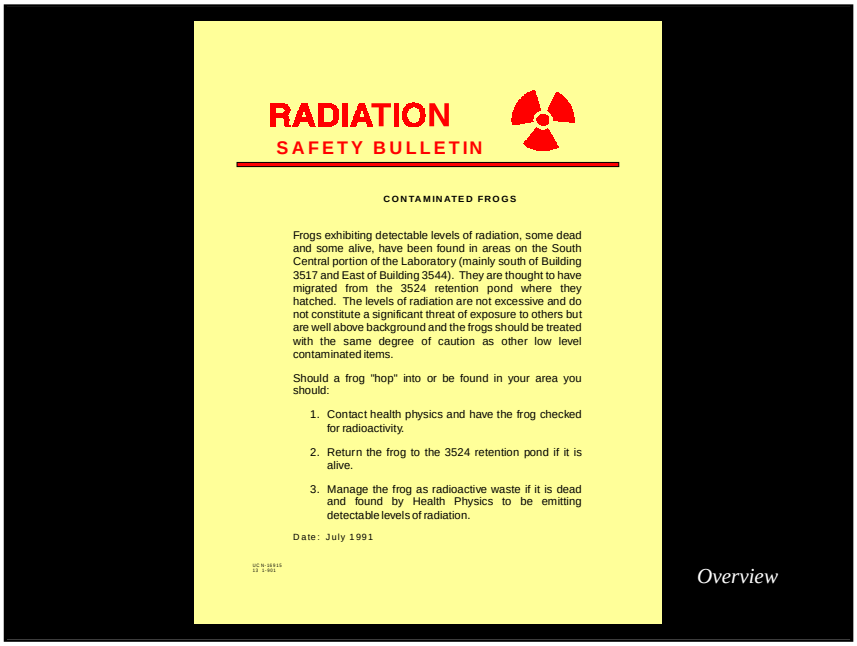

Aerial View, 1943
Whte Oak Dam
Whte Oak Creek
Surface
Impoundment
Gunite Tanks
Graphite Reactor
Chemical Plant
Overview

Notes:

Notes:

This is an aerial photograph of ORNL Waste Area Group (WAG) #1 that includes the original liquid waste impoundments described previously. In the photograph, the Graphite Reactor, the Chemical Pilot Plant, and the areas where the Gunite Tanks are located can be seen.

Later in the course this site will serve as the case study for a class exercise in determining ARARs.


RADIATION
SAFETY BULLETIN
CONTAMINATED FROGS
Frogs exhibiting detectable levels of radiation, some dead and some alive, have been found in areas on the South Central portion of the Laboratory (mainly south of Building 3517 and East of Building 3544). They are thought to have migrated from the 3524 retention pond where they hatched. The levels of radiation are not excessive and do not constitute a significant threat of exposure to others but are well above background and the frogs should be treated with the same degree of caution as other low level contaminated items.
Should a frog "hop" into or be found in your area you should:
1. Contact health physics and have the frog checked for radioactivity.
2. Return the frog to the 3524 retention pond if it is alive.
3. Manage the frog as radioactive waste if it is dead and found by Health Physics to be emitting detectable levels of radiation.
Date: July 1991
Overview

Notes:

Notes:

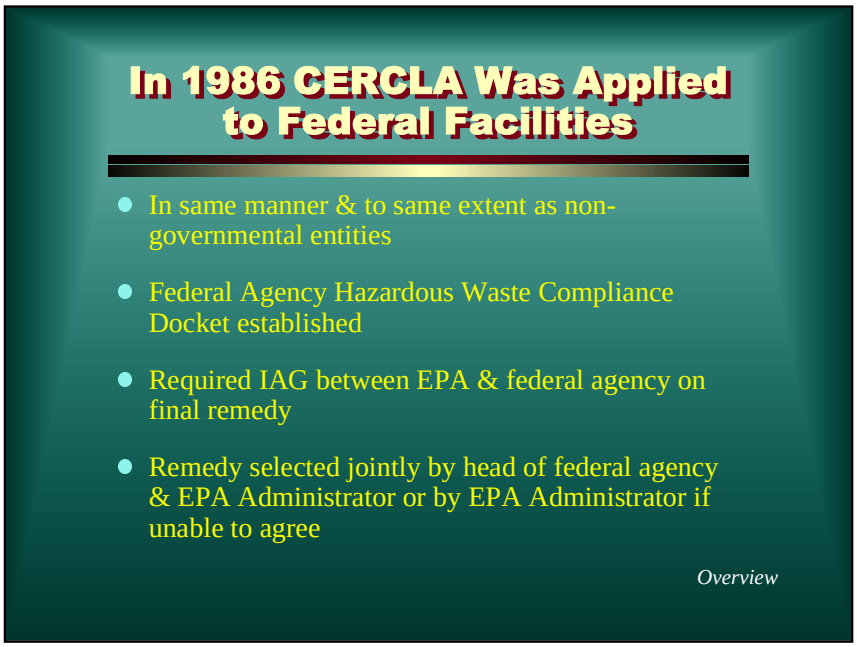
The significant legislation governing operations and activities at DOE facilities was passed by Congress in the 1950's and 1960's. However, beginning in the 1970's, Congress passed new environmental laws to deal with emerging problems of environmental pollution.

Notes:

Because laws governing DOE facilities were already on the books, these new environmental laws often specifically exempted wastes specifically regulated by the AEA.

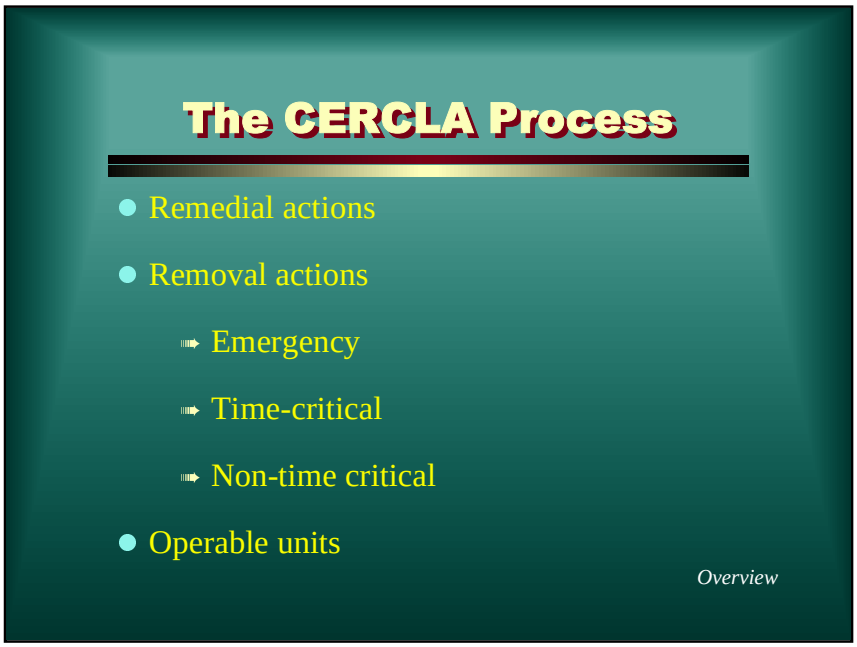
Because the first environmental laws often did not specifically identify federal facilities as being subject to their provisions and because of the cloak of "national security" secrecy surrounding operations at DOE facilities, the provisions of these new emerging environmental laws were typically ignored.

Activities and practices prohibited by law for individuals and private corporations could be (and were) practiced at DOE facilities.

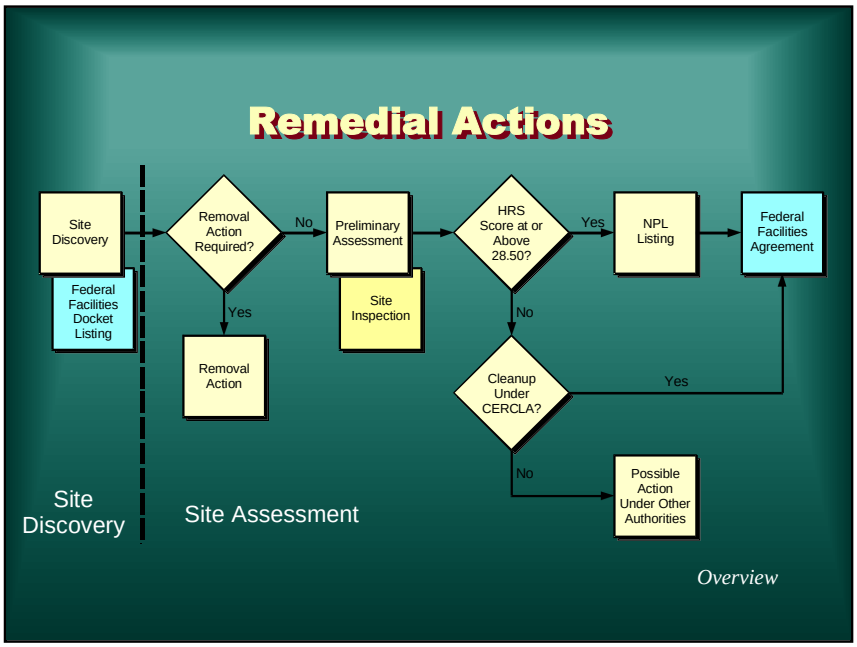


Notes:

Things began to change for DOE facilities in the mid-1980's. DOE lost a major court case involving effluent discharges to East Fork Poplar Creek from the Y-12 Weapons Plant in 1984. In 1986 Congress passed the first major reauthorization to CERCLA, the Superfund Amendments and Reauthorization Act (SARA), which specifically applied CERCLA to Federal Facilities. Several years later most DOE facilities were placed on the NPL.


The CERCLA Process
Remedial actions
Removal actions
Emergency
Time-critical
Non-time critical
Operable units
Overview

Notes:



Notes:

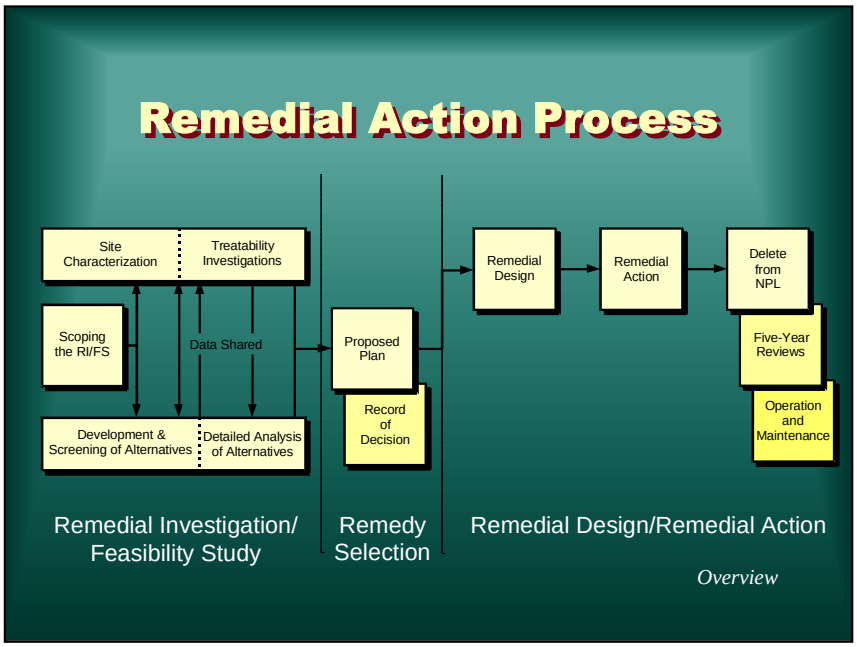
Site Discovery

Site discovery is the first phase of the CERCLA remedial process and occurs through various means including reports to EPA of releases, government investigations, land inventories or surveys, or incidental discoveries.

Site Assessment

Site assessment, the second phase, is outlined in the NCP at 40 CFR §300.420 and has investigative aspects similar to the RCRA Corrective Action process. First, DOE conducts a remedial preliminary assessment (PA), a "desktop" review of available site information, that includes collection of demographic information and physical site characteristics. Sites not posing sufficient threat to human health or the environment to warrant CERCLA response are screened out. The next step, the remedial site inspection (SI), may be required to further evaluate site conditions. This is a more detailed investigation of site conditions and usually involves sampling of environmental media. Information gathered from the remedial PA/SI is the basis for the third step—scoring the site using the Hazard Ranking System (HRS) (40 CFR §300.425), a model for assessing the site's relative threat to human health and the environment.

If a site scores at or above 28.50, it may be placed on the NPL, and a Remedial Investigation/Feasibility Study (RI/FS) is required. For sites not listed on the NPL, DOE's policy is to remediate contaminated sites using the CERCLA process or, when appropriate, processes such as RCRA. Within six months of NPL listing, DOE policy requires that the facility enter into a Federal Facilities Agreement (FFA) or Interagency Agreement (IAG) with EPA and the state to establish the requirements for conducting the RI/FS.



Notes:

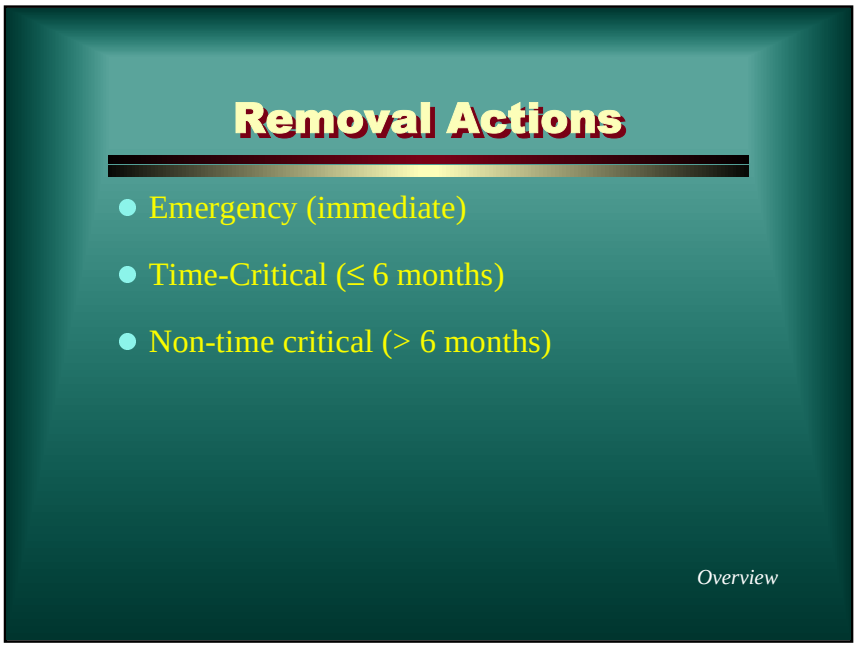
Remedial Investigation/Feasibility Study

The third phase of the remedial process is an RI/FS (40 CFR §300.430), a process that characterizes the site and evaluates various alternatives for cleanup. The RI is the collection of sufficient, detailed information to characterize site conditions, the nature and extent of the contamination, evaluate the risks posed by the site, assess the performance of options for remediation, and make an informed risk management decision.

The FS involves development, screening, and detailed evaluation of each remedial option. The RI and the FS are conducted concurrently. Conclusion of the RI/FS leads to the selection of the remedial option, the development of the proposed plan, and the signing of the Record of Decision (ROD). Once the ROD is signed the RI/FS has been completed.

Remedial Design/Remedial Action

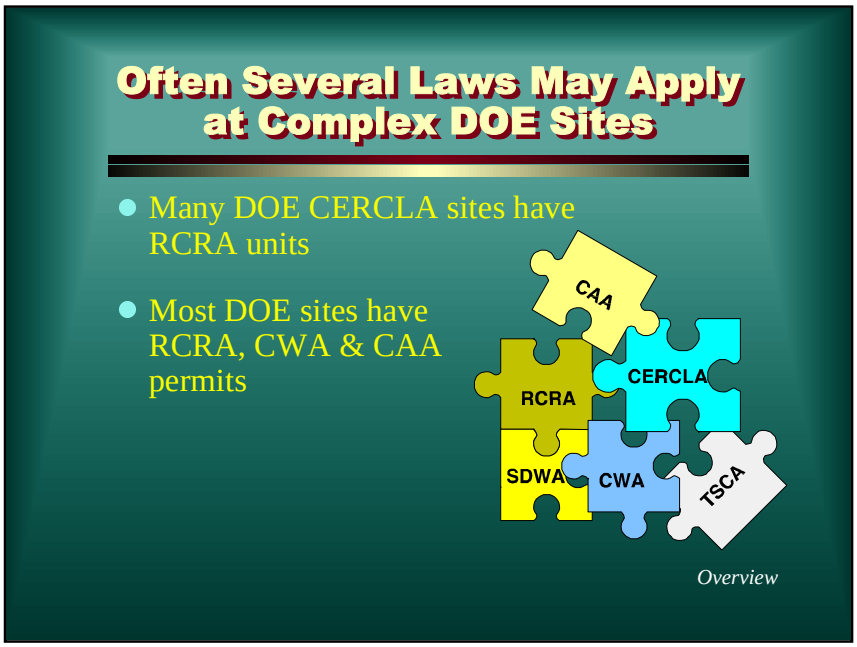
The final phase of the CERCLA remedial action process is the RD/RA where the selected remedy is implemented (40 CFR §400.435). The RD involves all aspects of designing the remedial action, including development of technical drawings, specifications, operational guidance, and training. The RA involves construction, operation, and monitoring of the remedial action selected for cleanup. Depending on site conditions, an RA may continue for many years. Upon completion of the RA and demonstration that the site has been remediated to required cleanup levels, the site may then be deleted from the NPL.


Removal Actions
Emergency (immediate)
Time-Critical (≤ 6 months)
Non-time critical (> 6 months)
Overview

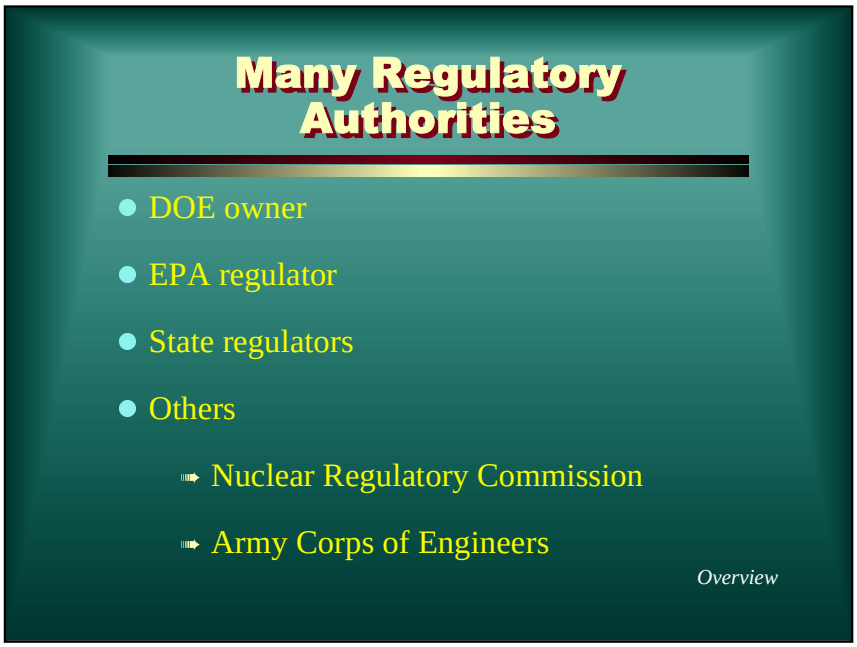
Notes:


The Regulatory Process
CERCLA required IAG between EPA & federal agency on final remedy
Remedy selected jointly by head of federal agency & EPA Administrator
If unable to agree, EPA Administrator makes decision
DOE established policy of instituting Federal Facility Agreements (FFAs) at all sites
Tri-party agreements
DOE, EPA & state
Overview

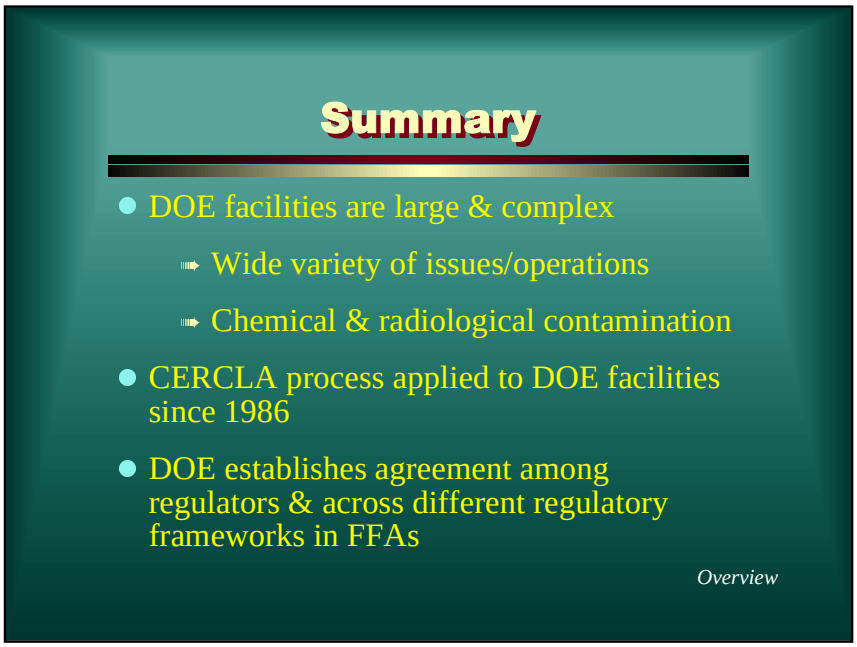
Notes:


Often Several Laws May Apply at Complex DOE Sites
Many DOE CERCLA sites have RCRA units
Most DOE sites have RCRA, CWA & CAA permits
CAA
CERCLA
RCRA
SDWA
CWA
TSCA
Overview

Notes:


Many Regulatory Authorities
DOE owner
EPA regulator
State regulators
Others
Nuclear Regulatory Commission
Army Corps of Engineers
Overview

Notes:


Summary
DOE facilities are large & complex
Wide variety of issues/operations
Chemical & radiological contamination
CERCLA process applied to DOE facilities since 1986
DOE establishes agreement among regulators & across different regulatory frameworks in FFAs
Overview

Notes: